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THESIS

AN ENLISTED PERFORMANCE PREDICTION MODEL FOR AVIATION STRUCTURAL MECHANICS

by

Robert Donald Whitmire
and
Charles Gray Deitchman

September 1983

Thesis Advisors:	Richard S. Elster James S. Blandin

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These models predict the future fleet performance of AMs as measured by length of service, paygrade achieved, and recommendation for reenlistment. Other results and recommendations regarding implementation and future research are discussed. Significant cost avoidance can be realized if these models are implemented.

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An Enlisted Performance Prediction Model for Aviation Structural Mechanics

by

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Submitted in partial fulfillment of the
requirements for the degree of

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I. INTRODUCTION

This analysis is designed to refine assignment standards for Aviation Structural Mechanics (AM) in the United States Navy. While most of the research to date has centered on "A" school success and attrition as the criteria [Ref. 1: p. 1], this study attempts to predict the operational performance of AMs in the fleet. This is considered an especially relevant topic since providing the proper quantity and quality of enlisted personnel at minimum cost to serve in the Navy's dynamic operational environment is the ultimate goal of the Navy's manpower programs.

> "Military commanders have associated poor scores in the mental tests with a variety of undesirable personnel qualities. It has been alleged that in addition to poor training success, those receiving low scores also have a much higher incidence of disciplinary problems, are much less likely to qualify for supervisory or combat leadership positions, and generally tend to lower unit morale and effectiveness." [Ref. 2: p. 82]

The AM rating is comprised of three specialized components: AMS (metal structures), AMH (hydraulics systems), and AME (safety equipment). For the purposes of this study the term, AM rating, will include all three branches. The AM rating is critical in terms of successful aircraft performance and high mission capability rates. The rating is common to all squadrons in naval aviation, and the squadrons' measure of effectiveness is highly dependent upon the quality of

work performed by these individuals. This is reflected by the large proportion of AMs assigned to Navy squadrons. For example, the VA-122 maintenance department total enlisted manpower requirements, spanning 15 different ratings, call for 365 personnel, of which 109 (30%) are AMs. [Ref. 3: pp. VI-2-4]

AMs work on metal structures, movable parts, control systems, and body surfaces of Naval aircraft. They also maintain air conditioning, heating, pressurization, and oxygen systems along with associated safety equipment. To be a competent AM requires an ability to handle tools, work with machines, possess manual dexterity, record keeping ability, and the capability to work as a team with other enlisted personnel in support of squadron maintenance objectives. [Ref. 4: p. 51]

Enlistment standards and assignment process research efforts are important because they can result in better manpower planning, lower attrition rates, better job performance, longer careers, and in the case of AMs, higher readiness levels for naval aviation squadrons. These outcomes have the potential to shift some of the burden for meeting endstrength requirements away from recruiters by maintaining a larger, more experienced career force. Meeting endstrengths may become increasingly difficult with the projected decline in the Navy's available manpower pool over the next decade. [Ref. 5: p. 82]

According to a study by Thomason [Ref. 6: p. 1], a Navy recruit generally has better chances of completing his first term of service in one rating than in another, i.e., his chances of success vary across ratings. This study combined with analyses of other Navy ratings could provide the Navy with the opportunity to enhance its assignment system. The benefit of a more efficient selection and assignment process, in terms of manpower and dollars, would be significant.

II. DATA BASE DEVELOPMENT

The master data base used in this analysis was created by merging three files keying on the individual's social security number. The first file was the Defense Manpower Data Center (DMDC) cohort file. This file was developed from accession information obtained from Armed Forces Entrance and Examining Stations (AFEES) and is updated biannually with approximately 150 variables. The second file was obtained from the Navy Health Research Center (NHRC) and contains information on all enlisted personnel, tracking their progress from enlistment to discharge with quarterly updates and approximately 30 variables. The third file was obtained from Chief of Naval Education and Training (CNET) and includes advancement information with approximately 50 variables.

With these three files combined on tapes, information on over 206,000 personnel who enlisted between September 1976 and December 1978 was available. All records were updated as recently as October 1982. From this data base, information on 6869 non-prior service AMs was extracted.

The results obtained using this information are only as valid as the data available. It should be evident that only those individuals actually enlisted in the Navy and associated with the AM rating were included in the analysis.

Therefore, this restricted AM sample cannot be generalized to the entire enlisted population.

By using the Statistical Analysis System (SAS), a number of screens were implemented to eliminate individuals whom it was not desirable to include in the data base. A frequency distribution of inter-service separation codes (Table 1) provides a breakdown explaining how personnel exited the Navy. Personnel with the following inter-service separation codes were specifically deleted:

Code	Reason for Separation
10	Medical conditions existing prior to service
11	Medical disability with severence pay
12	Permanent medical disability--retired
13	Temporary medical disability--retired
14	Medical disability without severence pay
15	Medical disability--title 10 retirement
16	Unqualified for active duty--other
22	Dependency or hardship discharge
32	Death
40	Entry into officer commissioning program
41	Entry into warrant officer program
42	Entry into service academy
50	20-30 years of service
94	Pregnancy

Personnel who fall into these categories are not included in the data set because they do not represent success or

failure in the AM rating. Personnel with the following separation codes are included in the analysis:

Code	Reason for Separation
0	Reenlistment or extension
1	Expiration of term of service
2	Early release--insufficient retainability
3	Early release--to attend school
8	Early release--other
60	Character or behavior disorder
61	Motivational problems (apathy)
63	Inaptitude
64	Alcoholism
65	Discreditable incidents
67	Drugs
68	Financial irresponsibility
71	Civil court conviction
72	Security
73	Court martial
74	Fraudulent entry
75	AWOL, desertion
76	Homosexuality
77	Sexual perversion
78	Good of the service
80	Misconduct
82	Unsuitability
86	Expeditious discharge

87	Trainee discharge
90	Secretarial authority
91	Erroneous enlistment or induction
96	Conscientious objector
98	Breach of contract
99	Other

For this study, success has been defined as:

1. completed the initial term of enlistment, and
2. achieved paygrade E-4, and
3. recommended for reenlistment.

Failure is defined as:

1. failed to complete an enlistment or
2. failed to be recommended for reenlistment.

For example, if an individual enters an officer commissioning program, he is generally considered a success, but in terms of the assignment process, inclusion of that individual does not indicate a successful assignment to the AM rating. This occurs because the data would indicate a failure to complete his initial enlistment. In accordance with the diagram in Table 2, this group of individuals was then divided into two data subsets which were used in the creation of two independent performance prediction models.

A data set was created to include all personnel who initially began their enlistment in the AM rating. This data set consisted of 3707 individuals and was the data base for model 1. Another data set was created to include all

personnel who transferred into the AM rating from some other initially assigned field. This data set consisted of 3021 individuals and was the data base for model 2.

After the data sets for model 1 and model 2 were created, 141 personnel of the original 6869 were left unaccounted for. These sailors have been identified as having transferred into the AM rating and then transferring into another rating prior to completion of their enlistment. They were not included in the analysis.

III. EVOLUTION OF THE VARIABLES

A. BACKGROUND

During World War II, standards for enlistment were not critical issues, since a fourth grade education was the requirement for acceptance into the armed forces. A series of general classification tests were used for assignment purposes and grouped recruits into four categories according to the scores achieved. The Armed Forces Qualification Test (AFQT) originated in 1950 to serve as a common screening device for use by all military services. This directed attention to the problems associated with enlistment standards but in the post-war era of conscription, little research was devoted to the recruitment of quality personnel. Although subjected to numerous revisions, the AFQT remained fundamentally intact until 1972. At that time the services were allowed to convert scores to form their own tests for use in rating and school assignments. The Navy's version, called the Basic Test Battery (BTB) consisted of a general classification test (GCT), arithmetic (ARI), mechanical comprehension (MECH), clerical speed (CLER), shop practice (SHOP), and electronic technical selection test (ETST). [Ref. 7: pp. 1-2]

When the All Volunteer Force (AVF) became effective, with the expiration of the Draft Extension Act on 1 July 1973,

the Navy had already implemented a Short Basic Test Battery (SBTB) which was intended to allow recruiters to increase their chances of achieving new AVF recruiting goals. The SBTB consisted of the GCT, ARI, and MECH subtest. This SBTB was eventually phased out by 1975 because a lower mental group distribution was being achieved than with the previous BTB. [Ref. 8: p. 1]

Developed in the 1960's in anticipation of the recruiting requirements associated with the possible elimination of the draft, the Armed Services Vocational Aptitude Battery (ASVAB) was instituted in January 1976 as the single Department of Defense selection and classification test. Three forms of the ASVAB became effective. ASVAB form 5 was administered to high school students for use by educators in general counseling. ASVAB forms 6 and 7 were administered by all services to potential applicants at Armed Forces Entrance and Examining Stations (AFEES), by mobile testing teams, or at a Naval Training Center. ASVAB forms 5, 6, and 7 covered the same information with the same degree of difficulty and consisted of 12 cognitive subtests. The AFQT score was not abandoned with the advent of ASVAB, but became a composite of three ASVAB subtests (word knowledge, arithmetic reasoning, and spacial perception). This score identified a recruit's degree of general trainability and provided an initial determination of enlistment eligibility. [Ref. 9: p. VII]

ASVAB forms 5, 6, and 7 were the versions taken by the personnel analyzed in this study and composite scores were used in assignment to ratings. It is noteworthy that this is the same set of ASVAB tests involved in the misnorming error of the late 1970's which placed some recruits in incorrect mental categories (especially in the Army) by inflating the scores of low-scoring personnel. Although unfortunate, the improper norming of the ASVAB has encouraged the services to improve the enlistment standards process. ASVAB forms 8, 9, and 10 modified and replaced forms 5, 6, and 7 in September 1980. [Ref. 10: p. 5]

Although significant progress has been made over the past decade of the AVF in the area of enlistment standards, the services still suffer from high first term attrition. [Ref. 11: p. 13] This requires more research in the effort to use enlistment standards and the rating assignment process to attract the quality of personnel required to handle the increased level of technology present in today's armed forces. "An ideal assignment system would integrate present and anticipated future needs of the Navy, and use this continually changing base of information against which to project the utility of each potential assignment." [Ref. 12: p. 1]

B. CRITERION VARIABLES

> "Personnel selection procedures in the past have usually been validated against training criteria rather than against job performance. The Navy's current personnel assignment system performs well in assigning

> qualified personnel to technical schools, but it appears to be less than adequate in predicting on-the-job performance." [Ref. 1: p. 1]

The Navy attempts to recruit the greatest number of personnel who will be eligible for several types of training. The assignment process attempts to determine those who will successfully complete training courses, complete their initial term of service, and be eligible to enter the career force. [Ref. 10: p. 2] This study focuses specifically on the assignment process, but it must be understood that the assignment process cannot be divorced from the recruiting and selection procedures used.

Success is a term frequently applied to descriptions of fleet performance by Navy personnel. However, there is no measure of success common to all of the services. In fact, the Navy does not even have its own definition of success, although "a Navy enlisted quality definition has drifted among a number of potential and partly related indicators." [Ref. 15: p. 1] Many of these indicators are used in current research, but most efforts address "A" school success and early attrition. Examples of criterion variables used in other related research follow.

When implementing ASVAB forms 8, 9, and 10 in 1980 the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics), in their report to the Senate and House Armed Services Committees [Ref. 10], used the following indicators of success in the Army:

1. E-4 or higher
2. completed first term of service
3. recommended for reenlistment
4. skill training course graduation
5. skill qualification test (SQT) results

Sands [Ref. 17: p. 12] developed a Prediction of Enlisted Tenure--2 Years (POET-2) model which incorporated multiple regression analysis of non-prior service males, to allow recruiters to screen applicants with a low probability of surviving the initial term of service. Completion of initial obligation and recommendation for reenlistment were the criterion variables used. These same dependent variables were used in describing the Odds for Effectiveness (OFE) table which defined an effective (successful) sailor.

Dann and Abrahams [Ref. 18] developed occupational interest scales (lambda scales) in their analysis of 15 Navy ratings involved with the Navy Vocational Interest Inventory (NVII). This work attempted to predict school grades, job satisfaction, and job performance.

Greenberg [Ref. 19: p. 3] identified training attrition, SQT scores, first term attrition, reenlistment eligibility, and promotion as reasonable proxies for job performance in his study for the Army.

The Marine Corps Operations Analysis Group initially evaluated four measures of job performance for enlisted

marines: recommendation for reenlistment, promotion, time to promotion, and supervisory ratings. They concluded that completing the first term of service and promotion to Corporal best reflected successful job performance. [Ref. 20: p. 14]

Elster and Flyer [Ref. 21: p. iv-24] examined educational credentials and performance, with the criterion of success defined as being on active duty after three years, completing an enlistment with an honorable discharge, or entry into an officer program.

Vineberg and Joyner [Ref. 1: p. 15] conducted research involving the prediction of job performance with suitability for service as the dependent variable. Suitability consisted of eligibility for reenlistment, incidence of misconduct, advancement in grade, performance ratings and type of discharge.

These studies all relate to the assignment process in that individual recruits must have suitable attributes to be properly assigned. The results of this study may provide the recruiting command with a better idea of the type of individuals it will need to recruit to adequately fill AM billets.

The results of the above studies suggest that no single-measure of job performance is totally comprehensive. The majority of these studies used some length of completed service, highest paygrade achieved, and reenlistment

recommendation as surrogate measures of job performance. This study uses variations of these outcomes as a surrogate measure of the actual fleet performance of individuals assigned to the AM rating.

Based upon these and other research efforts, and the authors' experience as naval aviators in fleet squadrons, this study, as previously mentioned, defines "success" as:

1. completed the initial term of enlistment, and
2. achieved paygrade E-4, and
3. recommended for reenlistment.

Category 1 in the various tables and matrices presented denotes the "success" category.

"Failure" is achieved in this study if either of the following measures are met:

1. failed to complete an enlistment or
2. failed to be recommended for reenlistment.

Category 2 in the various tables and matrices denotes the "failure" category.

These two categories, "success" and "failure" do not account for all of the AMs in the data set. A total of 568 personnel were excluded from analysis since they fell into a "gray area" in between the two criterion categories. This "gray area" is comprised of personnel who attained paygrade E-3 or less, but were recommended for retention in the Navy. These personnel do not represent the type of individual performance this study attempts to predict.

Individuals in these two categories were easily identified and thus amenable to analysis. The results of this study will give those making selection and assignment decisions an opportunity to do so with a better understanding of how they will impact on fleet performance. As previously explained, most of the current decisions are supported using analysis of training success or survivability; not job performance.

The criterion variables listed above were designed to measure a combination of on-the-job performance and survivability. To assign personnel to the rating it is not only desirable to know which recruits would be good performers, but also that they would finish their initial enlistment. Highest paygrade achieved and recommendation for reenlistment were determined to be satisfactory proxies for actual job performance, and the completion of an initial enlistment was a direct measure of survivability. The survival of these recruits is critical to the Navy because of the large amounts of resources expended in their acquisition and training.

It was determined that no direct measure of job performance was necessary because the previously mentioned studies indicated that highest paygrade and recommendation for reenlistment were reasonable surrogates.

Further explanation of the success definition is required. Completion of an enlistment was changed to

completion of three years, nine months of service in order to allow all personnel in the data base to qualify for eligibility in the successful category. This was necessary because, as previously mentioned, the data were updated only as recently as October 1982, which would exclude some 1978 entrants from meeting all three measures of success. This could result in a number of desirable personnel being classified as failures. This decision was validated by verifying that the number of 1976 and 1977 entrants who dropped from the successful to failure category during the final three months of their initial enlistment was insignificant. Based upon this finding, it was determined that it would be unlikely for the 1978 entrants to perform successfully for three years, nine months and then deteriorate to the failure category during the last three months of a four year enlistment. Three years, nine months was substituted in place of a four year enlistment without appreciable loss of prediction accuracy.

C. PREDICTOR VARIABLES

It appears that the primary objective of most recent research projects was to develop tools to assist recruiters in screening applicants for enlistment. Numerous explanatory variables have been used as indicated by the following examples of current literature.

Lurie [Ref. 23: p. 24] used a Cox regression model to estimate recruit survival. The predictors selected were dependent status, race, mental group, and educational level.

Another Lurie effort [Ref. 24: p. 28] attempted to devise survival curves for recruits using 1979 cross-sectional data, concluding that educational level had the most significant impact on the successful completion of an initial enlistment.

A third Lurie study [Ref. 25: p. 4] related enlistment standards to job performance. He used high school graduation and AFQT percentile as the predictors, recommending that future analyses consider ASVAB test scores to predict advancement in rate.

Lockman [Ref. 26] in a 2 June 1977 briefing to the Chief of Naval Personnel on revisions to Success Changes of Recruits Entering the Navy (SCREEN), described the effects of education, age, and race as predictors.

In a follow on analysis of SCREEN, Lockman [Ref. 27] looked at a group of non-prior service males entering the Navy in 1973. The predictor variables used in this case were educational level, mental group, age, marital status, and race which were applied to weighted linear and logit regressions.

Thomason [Ref. 6: p. 13] used age, educational level, participation in the delayed entry program, recruit training

location, mental group, race, and number of dependents in his probit analysis estimating the effects of characteristics on a recruit's probability of surviving a four year enlistment.

Sands [Ref. 17: pp. 2-4] used AFQT category, years of education completed, age at active duty base date, and number of dependents as the predictors employed in the previously mentioned POET-2 model. This study also looked at the OFE table described earlier and utilized AFQT score, number of years of school completed, number of expulsions and/or suspensions from school, and number of arrests as predictor variables to estimate the probability that a non-prior service male would render satisfactory naval service.

Cory [Ref. 30: p. 3] in his evaluation of category IV personnel, chose to analyze the effects of AFQT score, paygrade, BTB scores, and years of education among several explanatory variables.

Evanco [Ref. 31: p. 3] researched delayed entry program personnel and their assignments and success in "A" schools. The predictors used were education, mental group, age, and number of dependents.

Gardner [Ref. 32: p. 11] used race, AFQT, years of education, and age at entry in his thesis involving the screening of potential recruits to reduce first term attrition among enlisted personnel.

Elster and Flyer [Ref. 21: p. I-7] chose AFQT, high school graduation, and ASVAB scores as predictor variables in their study of performance mentioned earlier.

Vineberg and Joyner [Ref. 1: p. 21] in their previously discussed study, discovered that educational level, mental ability, age, and numerous aptitude variables consistently demonstrated predictive validity.

This study investigated 19 predictor variables (including 12 ASVAB subtests). These variables were chosen based on their success in previous research, their availability in the data base, and their possible usefulness as screening tools. The variable term of enlistment was selected in order to determine if it enhanced the individual's commitment to the Navy, and thus increased his likelihood of surviving and performing satisfactorily. The ASVAB test scores are available to all recruiters and classifiers and measure different areas of aptitude. These subtests were considered to have the highest likelihood of differentiating between the different ratings to which a recruit should be assigned.

The following list briefly explains each variable and provides the table containing its associated frequency distribution.

Table	Predictor Variable
3	AFQT percentile (based upon ASVAB subtests WK, AR, SP)
4	Entry age (from 17 to 38)
5	Highest year of education (recoded)

6	Marital status (1=other, 2=married)
7	Number of dependents (1=no dependents, 2=1 dependent, etc.)
8	Sex (1=male, 2=female)
9	Term of enlistment (number of years of service for which an individual has contracted)
10	ASVAB(AR) arithmetic reasoning
11	ASVAB(AD) attention to detail
12	ASVAB(AI) automotive information
13	ASVAB(EI) electronics intelligence
14	ASVAB(GI) general intelligence
15	ASVAB(GS) general science
16	ASVAB(MK) mathematical knowledge
17	ASVAB(MC) mechanical comprehension
18	ASVAB(NO) numerical operations
19	ASVAB(SI) shop information
20	ASVAB(SP) spacial perception
21	ASVAB(WK) word knowledge

IV. STATISTICAL TECHNIQUES

Three distinct statistical procedures are used in this analysis: frequency distribution, stepwise regression analysis, and discriminant analysis. All three procedures are conducted using the previously mentioned SAS computer package.

A. FREQUENCY ANALYSIS

Frequency distributions are used to provide the actual number and percentage of individuals in the sample, who fall into the success and failure categories, and to illustrate the range of the predictor variables. These totals provide the actual results of the Navy assignment process for 1976, 1977, and 1978 cohorts. These data provided a base with which to compare the results of this study.

B. STEPWISE REGRESSION

The stepwise regression procedure is used to determine which of the 19 potential predictor variables would best explain the differences between the criterion variables of success and failure.

The predictor variables are chosen on the basis of their ability to discriminate between the two criterion variables. The variables enter or leave the model according to two criteria:

1. A significance level of .05 or less, obtained from an analysis of covariance.
2. The squared partial correlation for predicting the variable under consideration, controlling for the effects of the variables previously selected [Ref. 35: p. 405]

This procedure begins by selecting the variable with the highest partial R^2 value. This variable is then paired with each of the other variables, and the selection criteria is computed. The variable, which together with the initial variable selected produces the highest R^2 value, is then entered into the equation. These two variables are compared with the remaining variables separately. The variable with the highest partial R^2 is selected as the third variable. This procedure is repeated for all potential predictors. At each step in the process a "F" test is conducted to ensure the variable entering is significant to the .05 level. If the variable is not significant to this level, the variable with the next highest R^2 value and a significance level of .05 or less is entered.

As variables enter the model, some of those previously selected may lose their discriminating power. This occurs because the difference explained between the categories becomes available in a combination of other included variables. This is dealt with at the beginning of each step by testing each of the preceeding variables to determine if they still make a sufficient contribution to the discriminating power of the model. If eligible for removal,

the least useful variable is eliminated. Once removed, a variable may reenter the model at any subsequent step provided it meets the eligibility criteria. When all variables in the model meet the criteria to remain, and no other variables meet the criteria for entry, the stepwise selection process stops. The use of the stepwise procedure ensures an optimal subset of the potential predictors is selected. [Ref. 36: pp. 447-448]

C. DISCRIMINANT ANALYSIS

The purpose of discriminant analysis is to classify observations into two or more categories on the basis of one or more numeric predictor variables. [Ref. 35: p. 381] This procedure identifies boundaries in terms of the variables which discriminate between the personnel in the criterion groups. The criterion categories must be mutually exclusive, and each group member must be measured on the same set of predictor variables. [Ref. 38: p. 218]

The discriminant procedure develops a model to classify each individual observation into one of the criterion groups. [Ref. 35: p. 381] This is achieved through the development of a cutoff score, which is the weighted sum of the predictor values. Based on the sum of these weighted values, individual observations are assigned probabilities of group membership, and are assigned to the group for which they have the highest probability. [Ref. 38: p. 220]

Cutoff scores are determined to minimize the number of classification errors. These errors occur because of the overlap that normally takes place between criterion groups with respect to the predictor variables. The smaller the difference between the groups, the greater the number of classification errors that will occur.

The Statistical Analysis System offers the option of assigning prior probabilities to the criterion categories. This feature allows the analyst to vary the proportions of the observations assigned to each category, or to accept the default value of equal porportions. This means that when the default value is used, and there are two criterion categories, prior probabilities of .5 will be assigned to each category. This tells the discriminant program that any observations are equally likely to fall into either category. [Ref. 35: p. 381] This can be a valuable tool if the researcher is reasonably sure of the prior proportions of the categories, or if one type of classification error is more costly than the other. In this analysis if it was determined to be more costly to classify a successful individual as a failure than to regard a failure as a success, prior probabilities could be used to reduce the number of the more costly errors. In this analysis, models are constructed with and without the prior probability feature.

It is imperative that this type of model be continually updated as data on following cohorts become available. This

would ensure that gradually changing differences between cohorts would be reflected in the model.

V. MODEL ONE

The first model was created for those personnel initially assigned to the AM rating. They were placed into a separate data set. These data were comprised of 3707 AM's: 2116 successful, 281 in the "gray area," and 1310 failures. All of the analyses concerning these individuals were conducted using this data set and excluded the 281 personnel in the "gray area."

After determining the criterion and predictor variables, as previously described, a frequency analysis was performed (Table 22). This provided the authors with the results of the Navy's process for initially assigning individuals to the AM rating. The frequency distribution shows, for all personnel assigned, 61.76% completed successful first enlistments. This percentage provided the information required to evaluate the worth of the model. To be of value, the model would have to improve upon this successful assignment rate of 61.76%.

Building the actual model required two basic statistical procedures: stepwise regression and discriminant analysis. The stepwise procedure identified six variables that best explained the differences between the success and failure categories based on 2395 personnel from the 1976 and 1977 cohorts (Table 23).

Of the six variables identified, the highest simple correlation between any two variables was .4089, between ASVAB(AI) and ASVAB(GS). This shows a relationship between the two, but was not considered significant enough to produce a multicollinearity problem. Of particular interest was the relationship between term of enlistment and highest year of education. The simple correlation of -.3109 indicates those individuals who signed up for a longer enlistment tended to be the least educated. In fact, term of enlistment was negatively correlated with all six of the predictor variables chosen in the stepwise process (Table 24). This is exactly what economic theory would predict. Individuals with greater ability and civilian opportunities would desire to enlist for shorter periods in order to be able to test the market for their skills in the least possible time.

Because term of enlistment was highly correlated with only highest year of education, and because it could not be considered a personal attribute, an additional stepwise regression was conducted without including the term of enlistment variable. Table 25 shows the deletion of term of enlistment as a variable did not produce any significant results. ASVAB(MK) and entry age entered the model as replacements, but the total explained variation (R^2) between the categories was substantially lower, than with term of enlistment included. These results indicate the

contributions of the variable, term of enlistment, cannot be fully explained using any combination of the other 18 variables. Further research needs to be conducted to explain why term of enlistment is such a significant indicator of an individual's ability to complete a successful enlistment as an AM.

Following the selection of the predictor variables, discriminant analysis was used in three separate trials to produce the most accurate model. Each of the three trials used the personnel who enlisted in 1976 and 1977 (n=2395) to establish the weighted coefficients, which assigned the individuals to the criterion categories. The model was validated using the 1978 cohort which included 1310 personnel. The first trial used all six variables indicated in Table 23 and prior probabilities of .5, with the results indicated in Table 26. The positions in the matrix are:

(1,1) The number of percentage of successful individuals assigned to the successful category.

(1,2) The number and percentage of individuals assigned to the successful category who were actual failures. (false positives)

(2,1) The number and percentage of successful individuals incorrectly classified as failures. (false negatives)

(2,2) The number and percentage of failures correctly classified.

The total "hit rate" is simply the percentage of correct classifications divided by the total number of classifications made. The results produced "hit rates" of 74.32% and

71.19% for the model and the validation, respectively. These rates are significantly better than the Navy's rate of 61.76%. This indicates that if this model had been used to classify those individuals who were initially assigned to the AM rating in 1978, the Navy would have had 9.43% fewer assignment errors.

In addition to just looking at "hit rates," one must examine how this model would be used in the decision making process. This model suggests that only those individuals who are predicted to be a success would be assigned to the AM rating. This means that for Model 1, 1655 individuals (69.1% of original pool of 2395) would be selected and 740 (30.9% of original pool) rejected. Of the 1655 selected, 1332 (55.6% of original pool or an 80.5% successful selection rate) were successful individuals. Therefore, if this model had been used for initially assigning the 1976 and 1977 cohorts to the AM rating, 1624 successful personnel (Table 26) would need to be identified. The obvious tradeoff involved here is that it requires a larger initial pool to choose from in order to achieve an equal number of successes. To select 1624 successful personnel, this model would have required an initial pool of 2921 (1624/55.6%) recruits. This would result in the need for and marginal cost of obtaining 526 (2921-2395) additional applicants. This approach would produce significant marginal benefits by rejecting 903 (2921 X 30.9%) of these applicants as failures,

and selecting 2018 (2921 X 69.1%), of which 1624 (2018 X 80.5%) would be successes and only 394 (2018-1624) failures. This is 377 (771-394) fewer failures then were actually selected.

The variable cost of recruiting a non-prior service, high school graduate in 1978 was approximately $2,400 [Ref. 42: p. 653]. Based on billet costs in 1978, the cost of assigning an individual, who subsequently failed, to the AM rating was approximately $15,900. This total was for an individual of paygrade E-2, and with only one year of service. The billet cost includes pay and allowances, medical, and other benefits. If one assumes that the individual is in a higher paygrade or has a longer length of service, their billet costs will escalate accordingly [Ref. 43: p. B-2). The billet cost is probably a conservative estimate of the marginal cost of a failure. [Ref. 44: p. 4]

Based on the cost of recruiting an individual, and his billet cost, the savings to the Navy can be computed if this model had been used for the 1976 and 1977 cohorts. It is recognized that billet cost is not computed using only marginal costs, however a significant amount of the total billet cost is marginal, and by using only the lowest billet cost figure available, the actual marginal cost of assigning a failure is certainly underestimated.

An example of the marginal cost of implementing model 1 yields a $1,262,400 (526 X $2,400) increase to recruit the

526 additional applicants needed. The resulting cost savings from the elimination of 377 failures becomes $5,994,300 (377 X $15,900). This produces a net cost reduction of $4,731,900.

A more optimistic approach would be obtained using the billet cost of $77,806 for an AM at paygrade E-4 with five years of service. This produces a net savings of $28,070,462 (377 X $77,806--$1,262,400) for the 1976 and 1977 cohorts. It is evident that the savings achieved can be extremely significant as reflected by the range from approximately $5 million to $28 million.

Since all of the data used in the model are currently being collected on all new recruits, the cost of implementing and using the model would be relatively small. The savings produced through its use can also be expected to grow as the size of the fleet increases to 15 carrier battle groups, and the demand for AMs increases accordingly.

These calculations and cost figures could be used for each variation of the model and would give decision makers a valid idea of the costs involved in future changes to selection and assignment criteria.

The discriminant function was again used on these same individuals using prior probabilities of .62 and .38 for the successful and failure categories. These probabilities indicate the actual distribution of AMs. These results are given in Table 27. The "hit rates" for the model and validation are 77.08% and 70.81%.

The third trial was conducted using the variables produced by the stepwise procedure after term of enlistment was deleted. The results of this discriminant output are shown in Table 28. The "hit rates" of 62.51% for the model, and 63.43% for the validation indicate that term of enlistment is a significant predictor of successful performance. Without its use, the model is no more accurate than the current system.

VI. MODEL TWO

This model and its derivations were created for those personnel not initially assigned to the AM rating, but who subsequently transferred into it. All of these individuals were placed into a separate data set comprised of 3021 personnel: 2122 of whom were successful, 512 who were failures, and 287 who fell into the "gray area." The analysis for Model 2 was conducted using this data set and all individuals in the "gray area" were deleted.

The initial step was to conduct a frequency analysis to provide the Navy's success rate in assigning these personnel. Table 29 shows that the Navy is successfully assigning 77.62% of those individuals transferring to the rating. This high success rate indicates that the Navy is doing exceptionally well in assigning these personnel. For this model to be of value, it will have to improve upon this rate.

The procedures used in building this model were identical to model 1. Stepwise regression was used to select the combination of variables that best discriminated between the successful and failure categories. These variables were then input into the discriminant analysis, which built the model using the individuals who enlisted in 1976 and 1977 (1885 personnel), and validated it using the 1978 cohort (n=849).

The 19 potential predictors were entered into the stepwise procedure. The six variables found to best discriminate between the criterion categories are shown in Table 30.

Term of enlistment was again found to be the best predictor of the criterion. The variables, number of dependents and marital status, had a simple correlation of .7682. This high correlation indicated the possibility of a multicollinearity problem.

The stepwise procedure was performed again, with term of enlistment deleted, to determine if any other variables would enter the model. The results are shown in Table 31.

Without term of enlistment in the model, only three of the other variables were found to discriminate between success and failure with a significance level of .05 or less. The low R^2 values indicate that these three variables explain little of the criterion variance, and a possible multicollinearity problem still exists, because marital status and number of dependents were both selected as predictor variables. In an attempt to alleviate these problems a third stepwise procedure was performed deleting term of enlistment and number of dependents, with the results given in Table 32. These results indicate that little of the variance between success and failure can be explained by the variables remaining. This occurred because of two factors:

1. The large percentage of successful AMs in the sample indicates that there may be little significant difference between the individuals in the successful and failure categories.
2. Little of the difference between the successful and unsuccessful AMs can be explained using the 19 variables chosen as potential predictors.

Three model variations were developed using: Prior probabilities of .5 for both categories, prior probabilities of .78 for successful individuals and .22 for those who were failures, and deleting term of enlistment as a predictor and using prior probabilities of .5 for each category.

The basic model for those people transferring into the AM rating uses the six predictor variables found in the stepwise procedure as the input to the discriminant function, and uses the SAS default prior probabilities of .5. This model relies solely on the variables to discriminate between success and failure with the output and the validation results depicted in Table 33.

Using the actual distribution of those personnel transferring into the AM rating in the years 1976-1978 the actual frequency distribution was 78% successful and 22% unsuccessful (Table 29). These two figures were used as the prior probabilities and the model and validation were computed with the results in Table 34.

This use of the prior probability function shows that the assignment criteria model can be adjusted to ensure that

more of the successful individuals are selected than would be otherwise. It is noteworthy that a larger percentage of individuals who were ultimately unsuccessful were selected. This tradeoff may be desirable for the Navy in a very tight recruiting market, where it would be more advantageous to select greater numbers of people, rather then have large shortfalls.

To illustrate the significance attached to the variable term of enlistment, it was deleted with the results shown in Table 35. The extremely poor results indicate the model needs a variable (s) to replace term of enlistment, and no combination of the other 18 variables used in this study could adequately replace it.

It is important to note, that for personnel transferring into the AM rating, the model presented in this analysis could not improve upon the current assignment process without the use of prior probabilities, and then by only 2%.

Model 2 suggests that only those personnel predicted to be successful would be allowed to transfer into the AM rating. This means that if model 2 had been used to select the 1976 and 1977 transferees, 1557 (82.6% = 1557/1885) of the original pool would have been selected (Table 33), of whom 1255 (66.6% of original pool) would have been successful. The actual number of successful and unsuccessful personnel in the 1976 and 1977 cohorts was 1409 and 476, respectively. To obtain the same quantity of successful

transferees using model 2 would require an applicant pool of 2116 (1409/66.6%). This is 231 (2116-1885) more than in the original pool. Of the 2116 applicants, 1748 (2116 X 82.6%) would be selected using model 2. From the 1748 selected, 1409 (1748 X 80.6%) would be successful and 339 (1748-1409) would be failures. This is 137 (476-339) fewer failures. These figures were derived from data presented in Table 33.

Since the additional 231 personnel required to implement the model are assumed to be available, their marginal cost is negligible since these individuals have already been recruited and indoctrinated. Based upon billet costs in 1978, the marginal cost of assigning a transferee to the AM rating, who subsequently fails, is approximately $16,465. This total assumes that the individual was in paygrade E-3 with one year of service. [Ref. 43: p. B-2] The marginal benefit of using this model for those personnel who transferred into the rating would then be $2,255,705 (137 X $16,465).

It appears more likely that the typical transferee who fails will have achieved a higher paygrade and have more time in service than a new recruit. This increases the cost of a failure to the Navy since a greater investment has been made in that individual. If one uses the billet cost of an E-4 with five years of service, the cost of a failure would

be $77,806. Using this model would then result in the Navy saving $10,659,422 (137 X $77,806).

Three factors help to explain the high degree of success the Navy has had in assigning personnel who transfer to the rating: these individuals have a history of performance in the Navy, most who attrite will already have done so before they attempt to transfer, and aviation communities tend to be considered desirable and thus have the ability to accept only the best of those requesting transfer. Further study should be conducted focusing on the use of items that are a part of these individuals' Navy records, such as evaluation marks and disciplinary history, prior to their transfer into the AM rating. This would be especially useful if the applicants for transfer who were not accepted into the rating were included in the analysis.

VII. CONCLUSIONS

The results obtained using Model 1 indicate potential for substantial improvement in the Navy's initial assignment of individuals to the AM rating. It is recognized that term of enlistment is probably not a useful variable to be used when actually assigning individuals, but the results of this study indicate that the significance of term of enlistment cannot be ignored. Model 2 shows that the Navy is extremely successful in assigning personnel who transfer to the AM rating.

The authors did not examine the differences between the three subgroups of the AM rating (AMS, AMH, AME). There is a possibility that the assignment of individuals to the rating could be further improved if the differences between the people in the subgroups were examined.

The costs of classification errors needs to be established. It seems reasonable to assume the cost of assigning a failure (false positive) is significantly higher than the cost of rejecting a successful person (false negative). The acceptance of a failure incurs the cost of recruiting, training, and paying that individual, plus the opportunity cost of not selecting a truly successful person. The cost of rejecting a true success would primarily be in recruiting another successful individual to replace him. If the costs

of one type of error (false positive) is significantly more than the other (false negative) a cost benefit analysis would establish the degree to which the model could be skewed to minimize the impact of the more costly error.

The literature search conducted for this study did not reveal any recent research findings dealing with the term of enlistment variable. Based on it's significance as revealed here further research should be conducted to explain if Navy policy is resulting in individuals with higher probabilities of failure being enlisted for the longer terms of service. Additional studies could examine other variables which might explain this difference.

While this study only examines those variables available at the time of enlistment, further effort could result in adding performance variables based on service completed to substantially improve the accuracy of the model.

The data that were available for this analysis did not include those individuals who were rejected in the assignment process. Using only those personnel who were actually assigned to the rating leaves open the possibility that those rejected, or not considered by the current process, may have become the best performers in the rating.

Research similar to this thesis is currently being conducted at the Naval Postgraduate School in Monterey, California for several other ratings. If these models were designed for all enlisted ratings they could be combined

into a master assignment system, which would have the potential for significantly improving the entire Navy assignment process.

If the Navy had implemented this model for the 1976 and 1977 cohorts, savings in the range of $6,987,605 ($2,555,705 + $4,731,900) to $38,729,884 ($10,659,422 + $28,070,462) could have resulted. This includes personnel initially assigned to and, those transferring into the AM rating. Because the AM rating is only a small fraction of the Navy's enlisted force, the use of similar models for all Navy ratings could potentially result in significantly greater savings. In an era of rising military manpower costs, the use of this model offers the Navy a possible method for reducing expenditures.

Since new testing devices are not required, the costs of implementing this type of model would be minimal. However, while improvement of the AM initial assignment process is possible, it should be determined if this is true for other ratings as well. Any improvements to the Navy's assignment process would subsequently reduce recruiting and training costs because efforts would be targeted at the proper caliber of individual. With the resulting increase in performance, potential exists for the possible reduction of required manning levels. The most important result of an improved assignment process would be increased fleet readiness levels. This potential increase in

readiness should become the factor driving more extensive research in areas associated with the assignment process.

TABLE 1

INTER-SERVICE SEPARATION CODES

ISC3	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	2164	2164	31.504	31.504
1	3720	5884	54.156	85.660
2	5	5889	0.073	85.733
3	1	5890	0.015	85.748
8	102	5992	1.485	87.232
60	112	6106	1.631	88.892
61	20	6126	0.291	89.183
63	62	6188	0.903	90.086
64	2	6190	0.029	90.115
65	189	6379	2.751	92.867
67	35	6414	0.510	93.376
68	1	6415	0.015	93.391
71	22	6437	0.320	93.711
72	3	6440	0.044	93.755
73	48	6488	0.699	94.453
74	14	6502	0.204	94.657
75	3	6505	0.044	94.701
76	22	6527	0.320	95.021
77	1	6528	0.015	95.036
78	53	6581	0.772	95.807
80	4	6585	0.058	95.865
82	66	6651	0.961	96.826
86	122	6773	1.776	98.602
87	1	6774	0.015	98.617
90	2	6776	0.029	98.646
91	55	6831	0.801	99.447
96	2	6833	0.029	99.476
98	2	6835	0.029	99.505
99	34	6869	0.495	100.000

TABLE 2

DATA BASE DEVELOPMENT

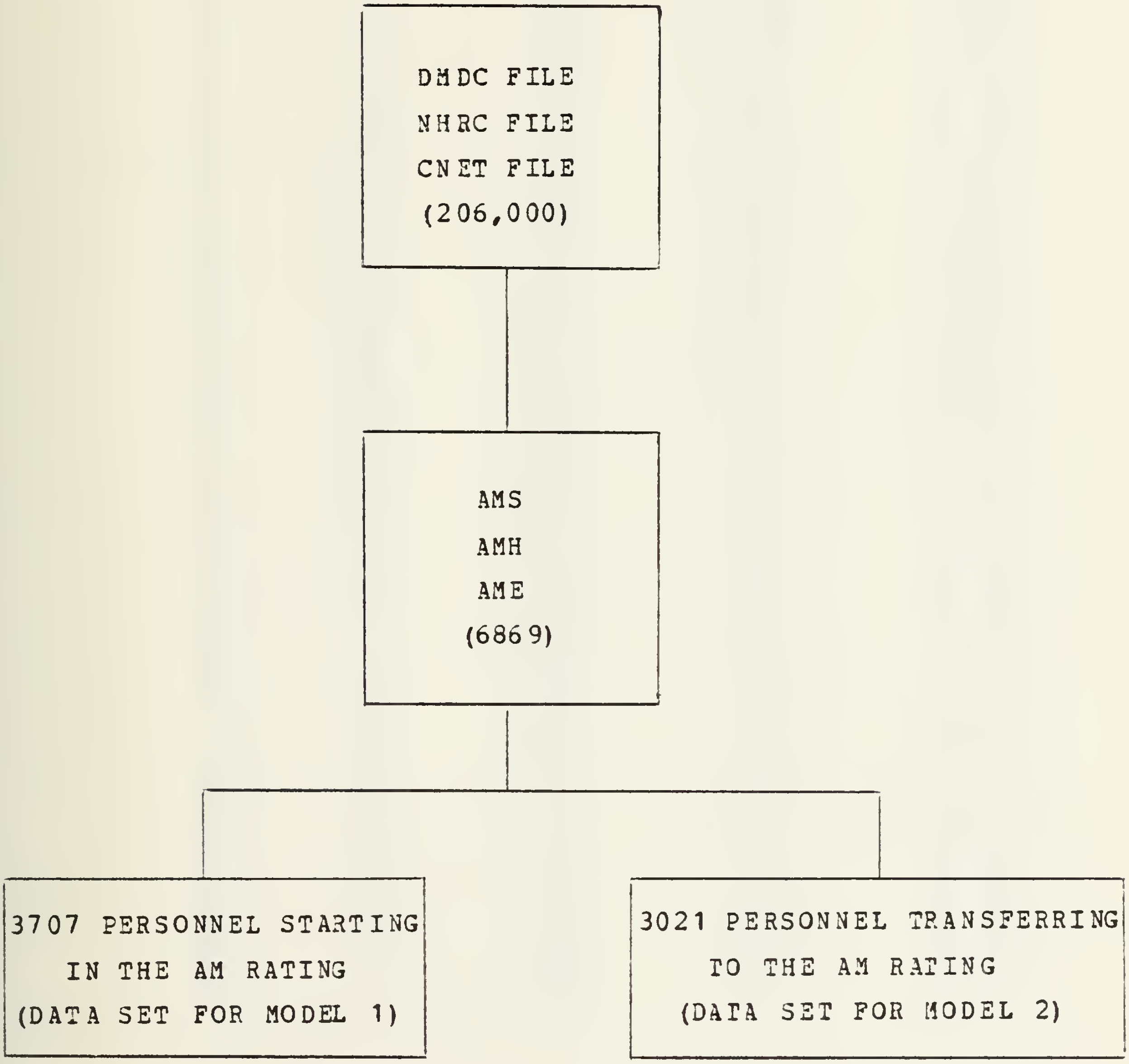
DMDC FILE
NHRC FILE
CNET FILE
(206,000)
AMS
AMH
AME
(6869)
3707 PERSONNEL STARTING IN THE AM RATING (DATA SET FOR MODEL 1)
3021 PERSONNEL TRANSFERRING TO THE AM RATING (DATA SET FOR MODEL 2)

TABLE 3

AFQT PERCENTILE

AFQTPCNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	35	35	0.510	0.510
1	1	36	0.015	0.524
5	1	37	0.015	0.539
6	1	38	0.015	0.553
9	1	39	0.015	0.568
10	4	43	0.058	0.626
11	5	48	0.073	0.699
12	2	50	0.029	0.728
13	7	57	0.102	0.830
14	44	101	0.641	1.470
15	58	159	0.844	2.315
16	75	234	1.092	3.407
17	135	369	1.965	5.372
18	187	556	2.722	8.094
19	242	798	3.523	11.617
21	294	1092	4.280	15.898
23	297	1389	4.324	20.221
25	390	1779	5.678	25.899
27	383	2162	5.576	31.475
29	382	2544	5.561	37.036
31	378	2922	5.503	42.539
33	375	3297	5.459	47.998
35	310	3607	4.513	52.511
38	266	3873	3.872	56.384
41	279	4152	4.062	60.445
44	268	4420	3.902	64.347
47	251	4671	3.654	68.001
50	236	4907	3.436	71.437
53	233	5140	3.392	74.829
56	231	5371	3.363	78.192
58	191	5562	2.781	80.972
60	176	5738	2.562	83.535
62	144	5882	2.096	85.631
65	144	6026	2.096	87.727
67	143	6169	2.082	89.809
69	1	6170	0.015	89.824
70	130	6300	1.893	91.716
72	92	6392	1.339	93.056
75	83	6475	1.208	94.264
77	79	6554	1.150	95.414
80	57	6611	0.830	96.244
82	59	6670	0.859	97.103
84	41	6711	0.597	97.700
86	41	6752	0.597	98.297
87	25	6777	0.364	98.661
89	26	6803	0.379	99.039
91	23	6826	0.335	99.374
93	13	6839	0.189	99.563
95	12	6851	0.175	99.738
97	8	6859	0.116	99.854
98	8	6867	0.116	99.971
99	2	6869	0.029	100.000

TABLE 4

AGE OF INDIVIDUAL AT TIME OF ENTRY

ENTRYAGE	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
17	993	993	14.456	14.456
18	2858	3851	41.607	56.063
19	1506	5357	21.925	77.988
20	605	5962	8.808	86.796
21	299	6261	4.353	91.149
22	202	6463	2.941	94.089
23	137	6600	1.994	96.084
24	103	6703	1.499	97.583
25	55	6758	0.801	98.384
26	35	6793	0.510	98.894
27	29	6822	0.422	99.316
28	20	6842	0.291	99.607
29	13	6855	0.189	99.796
30	9	6864	0.131	99.927
31	2	6866	0.029	99.956
34	2	6868	0.029	99.985
38	1	6869	0.015	100.000

TABLE 5

HIGHEST YEAR OF EDUCATION - (RECODED)

Old Value	Recoded Value
1 (1-7 years)	3.5
2 (8 years)	8
3 (9 years)	9
4 (10 years)	10
5 (11-12 years / no diploma)	11
6 (high school diploma)	12
7 (1 year of college)	13
8 (2 years of college)	14
9 (3-4 years of college / no degree)	15
10 (college graduate)	16
11 (masters degree or equivalent)	18
12 (doctorate or equivalent)	20
13 (high school G.E.D.)	11.5

CHYEC	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
8	7	7	0.102	0.102
9	52	59	0.757	0.859
10	374	433	5.445	6.304
11	861	1294	12.535	18.838
12	5427	6721	79.007	97.845
13	72	6793	1.048	98.894
14	41	6834	0.597	99.490
15	13	6847	0.189	99.680
16	22	6869	0.320	100.000

TABLE 6

MARITAL STATUS - (1=OTHER, 2=MARRIED)

MRTSTAT1	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	98	98	1.427	1.427
1	4340	4438	63.182	64.609
2	2431	6869	35.391	100.000

TABLE 7

NUMBER OF DEPENDENTS - (1=NONE)

NDPNDNT1	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	51	51	0.742	0.742
1	4380	4431	63.765	64.507
2	1480	5911	21.546	86.053
3	659	6570	9.594	95.647
4	238	6808	3.465	99.112
5	49	6857	0.713	99.825
6	11	6868	0.160	99.985
7	1	6869	0.015	100.000

TABLE 8

SEX - (1=MALE, 2=FEMALE)

SEX	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	6706	6706	97.627	97.627
2	163	6869	2.373	100.000

TABLE 9

TERM OF ENLISTMENT - (NO. OF YEARS)

TERMENLT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
2	38	38	0.553	0.553
3	10	48	0.146	0.699
4	5210	5258	75.848	76.547
6	1611	6869	23.453	100.000

TABLE 10

ASVAB APTITUDE AREA SCORE--SUBSCALE (AR)

ASVABAR	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	36	36	0.524	0.524
1	1	37	0.015	0.539
2	3	40	0.044	0.582
3	23	63	0.335	0.917
4	64	127	0.932	1.849
5	231	358	3.363	5.212
6	367	725	5.343	10.555
7	498	1223	7.250	17.805
8	678	1901	9.870	27.675
9	755	2656	10.991	38.666
10	739	3395	10.758	49.425
11	647	4042	9.419	58.844
12	601	4643	8.749	67.594
13	535	5178	7.789	75.382
14	445	5623	6.478	81.861
15	395	6018	5.750	87.611
16	302	6320	4.397	92.008
17	239	6559	3.479	95.487
18	150	6709	2.184	97.671
19	104	6813	1.514	99.185
20	56	6869	0.815	100.000

TABLE 11

ASVAB APTITUDE AREA SCORE--SUBSCALE (AD)

ASVABAD	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	38	38	0.553	0.553
1	1	39	0.015	0.568
2	7	46	0.102	0.670
3	6	52	0.087	0.757
4	16	68	0.233	0.990
5	23	91	0.335	1.325
6	42	133	0.611	1.936
7	106	239	1.543	3.479
8	162	401	2.358	5.838
9	272	673	3.960	9.798
10	363	1036	5.285	15.082
11	545	1581	7.934	23.016
12	630	2211	9.172	32.188
13	754	2965	10.977	43.165
14	762	3727	11.093	54.258
15	788	4515	11.472	65.730
16	633	5148	9.215	74.945
17	552	5700	8.036	82.982
18	389	6089	5.663	88.645
19	278	6367	4.047	92.692
20	178	6545	2.591	95.283
21	123	6668	1.791	97.074
22	79	6747	1.150	98.224
23	42	6789	0.611	98.835
24	29	6818	0.422	99.258
25	18	6836	0.262	99.520
26	13	6849	0.189	99.709
27	9	6858	0.131	99.840
28	8	6866	0.116	99.956
29	3	6869	0.044	100.000

TABLE 12

ASVAB APTITUDE AREA SCORE--SUBSCALE (AI)

ASVABAI	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	152	152	2.213	2.213
1	13	165	0.189	2.402
2	43	208	0.626	3.028
3	87	295	1.267	4.295
4	174	469	2.533	6.828
5	276	745	4.018	10.846
6	410	1155	5.969	16.815
7	439	1594	6.391	23.206
8	509	2103	7.410	30.616
9	553	2656	8.051	38.666
10	524	3180	7.628	46.295
11	532	3712	7.745	54.040
12	525	4237	7.643	61.683
13	456	4693	6.639	68.321
14	439	5132	6.391	74.712
15	377	5509	5.488	80.201
16	355	5864	5.168	85.369
17	341	6205	4.964	90.333
18	271	6476	3.945	94.279
19	255	6731	3.712	97.991
20	138	6869	2.009	100.000

TABLE 13

ASVAB APTITUDE AREA SCORE--SUBSCALE (EI)

ASVABEI	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	36	36	0.524	0.524
2	5	41	0.073	0.597
3	6	47	0.087	0.684
4	4	51	0.058	0.742
5	5	56	0.073	0.815
6	13	69	0.189	1.005
7	11	80	0.160	1.165
8	21	101	0.306	1.470
9	59	160	0.859	2.329
10	92	252	1.339	3.669
11	132	384	1.922	5.590
12	163	547	2.373	7.963
13	255	802	3.712	11.676
14	329	1131	4.790	16.465
15	380	1511	5.532	21.997
16	520	2031	7.570	29.568
17	552	2583	8.036	37.604
18	597	3180	8.691	46.295
19	617	3797	8.982	55.277
20	620	4417	9.026	64.303
21	572	4989	8.327	72.631
22	494	5483	7.192	79.822
23	412	5895	5.998	85.820
24	312	6207	4.542	90.362
25	227	6434	3.305	93.667
26	201	6635	2.926	96.593
27	109	6744	1.587	98.180
28	75	6819	1.092	99.272
29	38	6857	0.553	99.825
30	12	6869	0.175	100.000

TABLE 14

ASVAB APTITUDE AREA SCORE--SUBSCALE (GI)

ASVABGI	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	37	37	0.539	0.539
1	4	41	0.058	0.597
2	16	57	0.233	0.830
3	53	110	0.772	1.601
4	137	247	1.994	3.596
5	251	498	3.654	7.250
6	421	919	6.129	13.379
7	624	1543	9.084	22.463
8	856	2399	12.462	34.925
9	993	3392	14.456	49.381
10	995	4387	14.485	63.867
11	920	5307	13.394	77.260
12	736	6043	10.715	87.975
13	511	6554	7.439	95.414
14	243	6797	3.538	98.952
15	72	6869	1.048	100.000

TABLE 15

ASVAB APTITUDE AREA SCORE--SUBSCALE (GS)

ASVABGS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	43	43	0.626	0.626
1	1	44	0.015	0.641
2	19	63	0.277	0.917
3	31	94	0.451	1.368
4	79	173	1.150	2.519
5	168	341	2.446	4.964
6	343	684	4.993	9.958
7	529	1213	7.701	17.659
8	691	1904	10.060	27.719
9	826	2730	12.025	39.744
10	899	3629	13.088	52.832
11	802	4431	11.676	64.507
12	711	5142	10.351	74.858
13	569	5711	8.284	83.142
14	407	6118	5.925	89.067
15	304	6422	4.426	93.493
16	214	6636	3.115	96.608
17	124	6760	1.805	98.413
18	67	6827	0.975	99.389
19	33	6860	0.480	99.869
20	9	6869	0.131	100.000

TABLE 16

ASVAB APTITUDE AREA SCORE--SUBSCALE (MK)

ASVABMK	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	38	38	0.553	0.553
1	7	45	0.102	0.655
2	24	69	0.349	1.005
3	64	133	0.932	1.936
4	169	302	2.460	4.397
5	316	618	4.600	8.997
6	505	1123	7.352	16.349
7	597	1720	8.691	25.040
8	690	2410	10.045	35.085
9	727	3137	10.584	45.669
10	687	3824	10.001	55.670
11	670	4494	9.754	65.424
12	576	5070	8.386	73.810
13	454	5524	6.609	80.419
14	374	5898	5.445	85.864
15	300	6198	4.367	90.231
16	248	6446	3.610	93.842
17	182	6628	2.650	96.491
18	124	6752	1.805	98.297
19	76	6828	1.106	99.403
20	41	6869	0.597	100.000

TABLE 17

ASVAB APTITUDE AREA SCORE--SUBSCALE (MC)

ASVABMC	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	39	39	0.568	0.568
1	1	40	0.015	0.582
2	6	46	0.087	0.670
3	16	62	0.233	0.903
4	31	93	0.451	1.354
5	92	185	1.339	2.693
6	170	355	2.475	5.168
7	468	823	6.813	11.981
8	693	1516	10.089	22.070
9	830	2346	12.083	34.153
10	983	3329	14.311	48.464
11	898	4227	13.073	61.537
12	758	4985	11.035	72.572
13	596	5581	8.677	81.249
14	431	6012	6.275	87.524
15	305	6317	4.440	91.964
16	220	6537	3.203	95.167
17	153	6690	2.227	97.394
18	108	6798	1.572	98.966
19	56	6854	0.815	99.782
20	15	6869	0.218	100.000

TABLE 18

ASVAB APTITUDE AREA SCORE--SUBSCALE (NO)

ASVABNO	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	37	37	0.539	0.539
1	1	38	0.015	0.553
2	1	39	0.015	0.568
3	1	40	0.015	0.582
4	3	43	0.044	0.626
5	4	47	0.058	0.684
6	3	50	0.044	0.728
7	7	57	0.102	0.830
8	9	66	0.131	0.961
9	17	83	0.247	1.208
10	13	96	0.189	1.398
11	27	123	0.393	1.791
12	35	158	0.510	2.300
13	33	191	0.480	2.781
14	51	242	0.742	3.523
15	71	313	1.034	4.557
16	81	394	1.179	5.736
17	83	477	1.208	6.944
18	140	617	2.038	8.982
19	125	742	1.820	10.802
20	171	913	2.489	13.292
21	211	1124	3.072	16.363
22	209	1333	3.043	19.406
23	250	1583	3.640	23.046
24	321	1904	4.673	27.719
25	280	2184	4.076	31.795
26	324	2508	4.717	36.512
27	289	2797	4.207	40.719
28	347	3144	5.052	45.771
29	362	3506	5.270	51.041
30	333	3839	4.848	55.889
31	303	4142	4.411	60.300
32	328	4470	4.775	65.075
33	286	4756	4.164	69.239
34	271	5027	3.945	73.184
35	263	5290	3.829	77.013
36	255	5545	3.712	80.725
37	195	5740	2.839	83.564
38	188	5928	2.737	86.301
39	162	6090	2.358	88.659
40	152	6242	2.213	90.872
41	121	6363	1.762	92.634
42	98	6461	1.427	94.060
43	63	6524	0.917	94.977
44	50	6574	0.728	95.705
45	69	6643	1.005	96.710
46	54	6697	0.786	97.496
47	46	6743	0.670	98.166
48	41	6784	0.597	98.763
49	50	6834	0.728	99.490
50	35	6869	0.510	100.000

TABLE 19

ASVAB APTITUDE AREA SCORE--SUBSCALE (SI)

ASVABSI	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	130	130	1.893	1.893
1	5	135	0.073	1.965
2	5	140	0.073	2.038
3	22	162	0.320	2.358
4	42	204	0.611	2.970
5	67	271	0.975	3.945
6	116	387	1.689	5.634
7	168	555	2.446	8.080
8	236	791	3.436	11.516
9	328	1119	4.775	16.291
10	447	1566	6.507	22.798
11	497	2063	7.235	30.033
12	655	2718	9.536	39.569
13	686	3404	9.987	49.556
14	654	4058	9.521	59.077
15	613	4671	8.924	68.001
16	685	5356	9.972	77.974
17	552	5908	8.036	86.010
18	442	6350	6.435	92.444
19	345	6695	5.023	97.467
20	174	6869	2.533	100.000

TABLE 20

ASVAB APTITUDE AREA SCORE--SUBSCALE (SP)

ASVABSP	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	35	35	0.510	0.510
1	2	37	0.029	0.539
2	9	46	0.131	0.670
3	16	62	0.233	0.903
4	51	113	0.742	1.645
5	99	212	1.441	3.086
6	179	391	2.606	5.692
7	242	633	3.523	9.215
8	412	1045	5.998	15.213
9	530	1575	7.716	22.929
10	603	2178	8.779	31.708
11	640	2818	9.317	41.025
12	720	3538	10.482	51.507
13	706	4244	10.278	61.785
14	666	4910	9.696	71.481
15	569	5479	8.284	79.764
16	472	5951	6.871	86.636
17	388	6339	5.649	92.284
18	267	6606	3.887	96.171
19	173	6779	2.519	98.690
20	90	6869	1.310	100.000

TABLE 21

ASVAB APTITUDE AREA SCORE--SUBSCALE (WK)

ASVABWK	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	35	35	0.510	0.510
2	1	36	0.015	0.524
3	1	37	0.015	0.539
4	1	38	0.015	0.553
5	1	39	0.015	0.568
6	8	47	0.116	0.684
7	9	56	0.131	0.815
8	27	83	0.393	1.208
9	23	106	0.335	1.543
10	63	169	0.917	2.460
11	93	262	1.354	3.814
12	186	448	2.708	6.522
13	310	758	4.513	11.035
14	384	1142	5.590	16.625
15	440	1582	6.406	23.031
16	538	2120	7.832	30.863
17	607	2727	8.837	39.700
18	637	3364	9.274	48.974
19	535	3899	7.789	56.762
20	530	4429	7.716	64.478
21	411	4840	5.983	70.461
22	433	5273	6.304	76.765
23	372	5645	5.416	82.181
24	284	5929	4.135	86.315
25	238	6167	3.465	89.780
26	197	6364	2.868	92.648
27	186	6550	2.708	95.356
28	147	6697	2.140	97.496
29	100	6797	1.456	98.952
30	72	6869	1.048	100.000

TABLE 22

FREQUENCY DISTRIBUTION FOR MODEL 1

	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	2116	2116	61.763	61.763
2	1310	3426	38.237	100.000

TABLE 23

STEPWISE REGRESSION ANALYSIS OUTPUT FOR MODEL 1

STEPWISE SELECTION: SUMMARY

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	F STATISTIC	PROB > F
1	TERMENLT		1	0.1736	719.441	0.0001
2	MRTSTAT1		2	0.0779	288.999	0.0001
3	ASVABGS		3	0.0068	23.486	0.0001
4	CHYEC		4	0.0060	20.668	0.0001
5	ASVABNO		5	0.0045	15.429	0.0001
6	ASVABAI		6	0.0016	5.599	0.0180

TABLE 24

SIMPLE CORRELATIONS

	ASVABAI	ASVABSI	ASVABGI	ASVABNO	ASVABAD
ASVABAI	1.0000	0.6103	0.3451	0.1204	0.0401
ASVABSI	0.6103	1.0000	0.3251	0.1351	0.0687
ASVABGI	0.3451	0.3251	1.0000	0.1561	0.0271
ASVABNO	0.1204	0.1351	0.1561	1.0000	0.3586
ASVABAD	0.0401	0.0687	0.0271	0.3586	1.0000
ASVABWK	0.1851	0.2077	0.3795	0.1196	-.0064
ASVABAR	0.3283	0.3396	0.2652	0.3910	0.1482
ASVABSP	0.2254	0.2453	0.1267	0.1179	0.1405
ASVABMK	0.1758	0.1888	0.2161	0.4278	0.1958
ASVABEI	0.4951	0.4519	0.3511	0.1395	0.0410
ASVABMC	0.4008	0.3670	0.2439	0.1792	0.1224
ASVABGS	0.3350	0.3800	0.3818	0.1296	0.0218
ENTRYAGE	-.0146	-.0879	-.0615	-.0454	-.0057
CHYEC	0.0137	-.0125	0.0375	0.0333	0.0259
MRTSTAT1	0.0540	0.0208	0.0034	-.0116	0.0350
NDPNDNT1	0.0502	0.0066	-.0074	-.0275	0.0183
TERMENLT	-.0371	-.0222	-.0723	-.0586	-.0039
AFQTPCNT	0.3623	0.3878	0.3882	0.2937	0.1159
SEX	-.1191	-.1387	-.1100	0.0630	0.1050

	ASVABWK	ASVABAR	ASVABSP	ASVABMK	ASVABEI
ASVABAI	0.1851	0.3283	0.2254	0.1758	0.4951
ASVABSI	0.2077	0.3396	0.2453	0.1888	0.4519
ASVABGI	0.3795	0.2652	0.1267	0.2161	0.3511
ASVABNO	0.1196	0.3910	0.1179	0.4278	0.1395
ASVABAD	-.0064	0.1482	0.1405	0.1958	0.0410
ASVABWK	1.0000	0.2325	0.0337	0.2209	0.2826
ASVABAR	0.2325	1.0000	0.2467	0.5191	0.2907
ASVABSP	0.0337	0.2467	1.0000	0.2285	0.2547
ASVABMK	0.2209	0.5191	0.2285	1.0000	0.2229
ASVABEI	0.2826	0.2907	0.2547	0.2229	1.0000
ASVABMC	0.0161	0.3988	0.4192	0.3044	0.3917
ASVABGS	0.4287	0.3140	0.1868	0.2777	0.4108
ENTRYAGE	0.0706	-.0624	-.0239	-.0619	0.0263
CHYEC	0.0653	0.0315	-.0132	0.0982	0.0286
MRTSTAT1	-.0259	0.0132	0.0144	-.0143	0.0463
NDPNDNT1	-.0141	0.0021	0.0087	-.0379	0.0218
TERMENLT	-.0348	-.0790	-.0068	-.1257	-.0459
AFQTPCNT	0.6773	0.7150	0.5858	0.4743	0.4038
SEX	0.0610	0.0012	0.0089	0.0236	-.0930

	ASVABMC	ASVABGS	ENTRYAGE	CHYEC	MRTSTAT1
ASVABAI	0.4008	0.3350	-.0146	0.0137	0.0540
ASVABSI	0.3670	0.3800	-.0879	-.0125	0.0208
ASVABGI	0.2439	0.3818	-.0615	0.0375	0.0034
ASVABNO	0.1792	0.1296	-.0454	0.0333	-.0116
ASVABAD	0.1224	0.0218	-.0057	0.0259	0.0350
ASVABWK	0.0161	0.4287	0.0706	0.0653	-.0259
ASVABAR	0.3988	0.3140	-.0624	0.0315	0.0132
ASVABSP	0.4192	0.1868	-.0239	-.0132	0.0144
ASVABMK	0.3044	0.2777	-.0619	0.0982	-.0143
ASVABEI	0.3917	0.4108	0.0263	0.0286	0.0463
ASVABMC	1.0000	0.3430	-.0860	0.0208	0.0346
ASVABGS	0.3430	1.0000	-.0253	0.0675	0.0100
ENTRYAGE	-.0860	-.0253	1.0000	0.2573	0.0942
CHYEC	0.0208	0.0675	0.2573	1.0000	0.0691
MRTSTAT1	0.0346	0.0100	0.0942	0.0691	1.0000
NDPNDNT1	0.0197	-.0120	0.1771	0.0701	0.7681
TERMENLT	-.0510	-.0928	-.0131	-.3109	-.0689
AFQTPCNT	0.3880	0.4774	-.0004	0.0501	-.0007
SEX	-.0698	-.0037	0.1312	0.0465	0.0152

	NDPNDNT1	TERMENLT	AFQTPCNT	SEX
ASVABAI	0.0502	-.0371	0.3623	-.1191
ASVABSI	0.0066	-.0222	0.3878	-.1387
ASVABGI	-.0074	-.0723	0.3882	-.1100
ASVABNO	-.0275	-.0586	0.2937	0.0630
ASVABAD	0.0183	-.0039	0.1159	0.1050
ASVABWK	-.0141	-.0348	0.5773	0.0610
ASVABAR	0.0021	-.0790	0.7150	0.0012
ASVABSP	0.0087	-.0068	0.5858	0.0089
ASVABMK	-.0379	-.1257	0.4743	0.0236
ASVABEI	0.0218	-.0459	0.4038	-.0930
ASVABMC	0.0197	-.0510	0.3880	-.0698
ASVABGS	-.0120	-.0928	0.4774	-.0037
ENTRYAGE	0.1771	-.0131	-.0004	0.1312
CHYEC	0.0701	-.3109	0.0501	0.0465
MRTSTAT1	0.7681	-.0689	-.0007	0.0152
NDPNDNT1	1.0000	-.0622	-.0012	-.0159
TERMENLT	-.0622	1.0000	-.0692	-.0525
AFQTPCNT	-.0012	-.0692	1.0000	0.0400
SEX	-.0159	-.0525	0.0400	1.0000

TABLE 25

STEPWISE REGRESSION ANALYSIS OUTPUT FOR MODEL 1

(TERM OF ENLISTMENT DELETED)

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              STEPWISE SELECTION:  SUMMARY
          VARIABLE        NUMBER   PARTIAL      F       PROB >
STEP   ENTERED   REMOVED    IN       R**2   STATISTIC     F

  1   MRTSTAT1               1      0.0794   295.243  0.0001
  2   CHYEC                  2      0.0390   138.771  0.0001
  3   ASVABMK                3      0.0121    41.751  0.0001
  4   ASVABGS                4      0.0057    19.590  0.0001
  5   ENTRYAGE               5      0.0030    10.255  0.0014
  6   ASVABNO                6      0.0021     7.307  0.0069
  7   ASVABAI                7      0.0012     4.229  0.0398
```

TABLE 26

DISCRIMINANT ANALYSIS OUTPUT AND VALIDATION FOR MODEL 1

(PRIOR PROBABILITIES = .5)

CLASSIFICATION MATRIX

	1	2	TOTAL
1	1332	323	1655
	80.48	19.52	100.00
2	292	448	740
	39.46	60.54	100.00
TOTAL	1624	771	2395
PERCENT	67.81	32.19	100.00
HIT RATE		74.32%	

VALIDATION MATRIX

	1	2	TOTAL
1	294	167	461
	63.77	36.23	100.00
2	130	440	570
	22.81	77.19	100.00
TOTAL	424	607	1031
PERCENT	40.76	59.24	100.00
HIT RATE		71.19%	

TABLE 27

DISCRIMINANT ANALYSIS OUTPUT AND VALIDATION FOR MODEL 1

(PRIOR PROBABILITIES = .62 / .38)

CLASSIFICATION MATRIX

	1	2	TOTAL
1	1508	147	1655
	91.12	8.88	100.00
2	402	338	740
	54.32	45.68	100.00
TOTAL	1910	485	2395
PERCENT	79.75	20.25	100.00

HIT RATE 77.08%

VALIDATION MATRIX

	1	2	TOTAL
1	358	103	461
	77.66	22.34	100.00
2	198	372	570
	34.74	65.26	100.00
TOTAL	556	475	1031
PERCENT	53.93	46.06	100.00

HIT RATE 70.81%

TABLE 28

DISCRIMINANT ANALYSIS OUTPUT AND VALIDATION FOR MODEL 1

(TERM OF ENLISTMENT DELETED)

(PRIOR PROBABILITIES = .5)

CLASSIFICATION MATRIX

	1	2	TOTAL
1	981	674	1655
	59.27	40.73	100.00
2	224	516	740
	30.27	69.73	100.00
TOTAL	1205	1190	2395
PERCENT	50.31	49.69	100.00
HIT RATE		62.51%	

VALIDATION MATRIX

	1	2	TOTAL
1	248	213	461
	53.80	46.20	100.00
2	164	406	570
	28.77	71.23	100.00
TOTAL	412	619	1031
PERCENT	39.96	60.04	100.00
HIT RATE		63.43%	

TABLE 29

FREQUENCY DISTRIBUTION FOR MODEL 2

	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	2122	2122	77.615	77.615
2	612	2734	22.385	100.000

TABLE 30

STEPWISE REGRESSION ANALYSIS OUTPUT FOR MODEL 2

STEPWISE SELECTION: SUMMARY

	VARIABLE		NUMBER	PARTIAL	F	PROB >
STEP	ENTERED	REMOVED	IN	R**2	STATISTIC	F
1	TERMENLT		1	0.0950	286.729	0.0001
2	CHYEC		2	0.0239	66.984	0.0001
3	NDPNDNT1		3	0.0191	53.044	0.0001
4	AFQTPCNT		4	0.0021	5.787	0.0162
5	ASVABMK		5	0.0024	6.518	0.0107
6	MRTSTAT1		6	0.0019	5.294	0.0215

TABLE 31

STEPWISE REGRESSION ANALYSIS OUTPUT FOR MODEL 2

(TERM OF ENLISTMENT DELETED)

```
                STEPWISE SELECTION:  SUMMARY
          VARIABLE       NUMBER  PARTIAL     F        PROB >
STEP   ENTERED   REMOVED   IN      R**2    STATISTIC     F

  1  CHYEC                 1     0.0241     67.484  0.0001
  2  MRTSTAT1              2     0.0197     54.852  0.0001
  3  NDPNDNT1              3     0.0021      5.845  0.0157
```

TABLE 32

STEPWISE REGRESSION ANALYSIS OUTPUT FOR MODEL 2

(NUMBER OF DEPENDENTS AND TERM OF ENLISTMENT DELETED)

```
                STEPWISE SELECTION:  SUMMARY
          VARIABLE       NUMBER  PARTIAL     F        PROB >
STEP   ENTERED   REMOVED   IN      R**2    STATISTIC     F

  1  CHYEC                 1     0.0241     67.484  0.0001
  2  MRTSTAT1              2     0.0197     54.852  0.0001
```

TABLE 33

DISCRIMINANT ANALYSIS OUTPUT AND VALIDATION FOR MODEL 2

(PRIOR PROBABILITIES = .5)

CLASSIFICATION MATRIX

	1	2	TOTAL
1	1255	302	1557
	80.60	19.40	100.00
2	154	174	328
	46.95	53.05	100.00
TOTAL	1409	476	1885
PERCENT	74.75	25.25	100.00

HIT RATE 75.81%

VALIDATION MATRIX

	1	2	TOTAL
1	429	136	565
	75.93	24.07	100.00
2	108	176	284
	38.03	61.97	100.00
TOTAL	537	312	849
PERCENT	63.25	36.75	100.00

HIT RATE 71.26%

TABLE 34

DISCRIMINANT ANALYSIS OUTPUT AND VALIDATION FOR MODEL 2

(PRIOR PROBABILITIES = .78 / .22)

CLASSIFICATION MATRIX

	1	2	TOTAL
1	1460	97	1557
	93.77	6.23	100.00
2	222	106	328
	67.68	32.32	100.00
TOTAL	1682	203	1885
PERCENT	89.23	10.77	100.00

HIT RATE 83.08%

VALIDATION MATRIX

	1	2	TOTAL
1	511	54	565
	90.44	9.56	100.00
2	168	116	284
	59.15	40.85	100.00
TOTAL	679	170	849
PERCENT	80.36	19.54	100.00

HIT RATE 80.21%

TABLE 35

DISCRIMINANT ANALYSIS OUTPUT AND VALIDATION FOR MODEL 2

(TERM OF ENLISTMENT DELETED)

(PRIOR PROBABILITIES = .5)

CLASSIFICATION MATRIX

	1	2	TOTAL
1	661	896	1557
	42.45	57.55	100.00
2	83	245	328
	25.30	74.70	100.00
TOTAL	744	1141	1885
PERCENT	39.47	60.53	100.00

HIT RATE 48.06%

VALIDATION MATRIX

1	238	327	565
	42.12	57.88	100.00
2	58	226	284
	20.42	79.58	100.00
TOTAL	296	553	849
PERCENT	34.85	65.15	100.00

HIT RATE 54.65%

APPENDIX A

SAS PROGRAM TO SCREEN PERSONNEL NOT DESIRABLE FOR ANALYSIS

```
//WHITMIRE JOB (2440,0171),'WHITMIRE SMC 2309',CLASS=C
//   EXEC SAS
//*MAIN ORG=NPGVM1.2440P
//FILEIN DD  DISP=SHR,DSN=MSS.S2440.LASTTRY
//FILEOUT DD UNIT=3330V,MSVGP=PUB4Z,DISP=(NEW,CATLG),
//   DSN=MSS.S2440.LASTONE,DCB=(BLKSIZE=6400)
//SYSIN DD *
DATA FILEOUT.LASTONE;SET FILEIN.LASTTRY;
KEEP=0;
IF(ISC3 EQ 32) THEN KEEP=9;
IF(ISC3 EQ 50) THEN KEEP=9;
IF(ISC3 EQ 94) THEN KEEP=9;
IF((ISC3 GE 10) AND (ISC3 LE 16)) THEN KEEP=9;
IF((ISC3 GE 40) AND (ISC3 LE 42)) THEN KEEP=9;
IF(ISC3 EQ 22) THEN KEEP=9;
IF KEEP NE 9;
/*
//
```

APPENDIX B

SAS PROGRAM TO CREATE DATA SET FOR MODEL 1

```
//WHITMIRE JOB (2440,0171),'WHITMIRE SMC 2309',CLASS=C
//   EXEC SAS
//FILEIN DD  DISP=SHR,DSN=MSS.S2440.LASTONE
//FILEOUT DD UNIT=3330V,MSVGP=PUB4Z,DISP=(NEW,CATLG),
//   DSN=MSS.S2440.AMSTART,DCB=(BLKSIZE=6400)
//SYSIN DD *
DATA FILEOUT.AMSTART;SET FILEIN.LASTONE;
IF((RCPGSCRT GE 6900) AND (RCPGSCRT LE 6903));
KEEP=0;
/*
//
```

APPENDIX C

SAS PROGRAM TO CREATE DATA SET FOR MODEL 2

```
//WHITMIRE JOB (2440,0171),'WHITMIRE SMC 2309',CLASS=C
//   EXEC SAS
//FILEIN DD  DISP=SHR,DSN=MSS.S2440.LASTONE
//FILEOUT DD UNIT=3330V,MSVGP=PUB4Z,DISP=(NEW,CATLG),
//   DSN=MSS.S2440.AMEND,DCB=(BLKSIZE=6400)
//SYSIN DD *
DATA FILEOUT.AMEND;SET FILEIN.LASTONE;
IF((DMDCRATE EQ 'AMS') OR (DMDCRATE EQ 'AMH') OR
       (DMDCRATE EQ 'AME'));
IF((RCPGSCRT LT 6900) OR (RCPGSCRT GT 6903));
KEEP=0;
/*
//
```

APPENDIX D

SAS PROGRAM TO EXECUTE A STEPWISE REGRESSION ANALYSIS FOR MODEL 1

```
//WHITMIRE JOB (2440,0171),'WHITMIRE SMC 2309',CLASS=B
//*MAIN ORG=NPGVM1.2440P
//   EXEC SAS
//FILEIN DD DISP=SHR,DSN=MSS.S2440.AMSTART
//SYSIN DD *
OPTIONS NOCENTER LS=75 NODATE;
DATA; SET FILEIN.AMSTART;
IF HYEC=1 THEN CHYEC=3.5;
IF HYEC=2 THEN CHYEC=8;
IF HYEC=3 THEN CHYEC=9;
IF HYEC=4 THEN CHYEC=10;
IF HYEC=5 THEN CHYEC=11;
IF HYEC=6 THEN CHYEC=12;
IF HYEC=7 THEN CHYEC=13;
IF HYEC=8 THEN CHYEC=14;
IF HYEC=9 THEN CHYEC=15;
IF HYEC=10 THEN CHYEC=16;
IF HYEC=11 THEN CHYEC=18;
IF HYEC=12 THEN CHYEC=20;
IF HYEC=13 THEN CHYEC=11.5;
HYEC=CHYEC;
IF((DMDCRATE NE 'AMS') OR (DMDCRATE NE 'AMH') OR
(DMDCRATE NE 'AME')) THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=1;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=2;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF CATEGORY=1 THEN C1=1;
IF CATEGORY=2 THEN C1=.;
IF CATEGORY=3 THEN C1=2;
PROC FREQ; TABLES C1;
PROC STEPDISC SIMPLE STDMEAN TCORR WCORR; VAR  ASVABAI ASVABSI
     ASVABGI ASVABNO ASVABAD ASVABWK ASVABAR ASVABSP ASVABMK
     ASVABEI ASVABMC ASVABGS ENTRYAGE CHYEC MRTSTAT1 NDPNDNT1
     TERMENLT AFQTPCNT SEX;
CLASS C1;
/*
//
```

APPENDIX E

SAS PROGRAM TO EXECUTE A DISCRIMINANT ANALYSIS AND VALIDATION FOR MODEL 1

```
//WHITMIRE JOB (2440,0171),'WHITMIRE SMC 2309',CLASS=C
//*MAIN ORG=NPGVM1.2440P
//   EXEC SAS
//FILEIN DD DISP=SHR,DSN=MSS.S2440.AMSTART
//SYSIN DD *
OPTIONS NOCENTER LS=75 NODATE;
DATA; SET FILEIN.AMSTART;
IF HYEC=1 THEN CHYEC=3.5;
IF HYEC=2 THEN CHYEC=8;
IF HYEC=3 THEN CHYEC=9;
IF HYEC=4 THEN CHYEC=10;
IF HYEC=5 THEN CHYEC=11;
IF HYEC=6 THEN CHYEC=12;
IF HYEC=7 THEN CHYEC=13;
IF HYEC=8 THEN CHYEC=14;
IF HYEC=9 THEN CHYEC=15;
IF HYEC=10 THEN CHYEC=16;
IF HYEC=11 THEN CHYEC=18;
IF HYEC=12 THEN CHYEC=20;
IF HYEC=13 THEN CHYEC=11.5;
HYEC=CHYEC;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=1;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=2;
IF CATEGORY=1 THEN C1=1;
IF CATEGORY=2 THEN C1=.;
IF CATEGORY=3 THEN C1=2;
DATA AMAM76; SET DATA1; IF BASD3YR LT 78;
DATA AMAM78; SET DATA1; IF BASD3YR GE 78;
PROC DISCRIM DATA=AMAM76 OUT=B7677 SIMPLE;
   VAR TERMENLT MRTSTAT1 ASVABGS CHYEC ASVABNO ASVABAI;
CLASS C1;
PROC DISCRIM TESTDATA=AMAM78 DATA=B7677; TESTCLASS C1;
/*
//
```

APPENDIX F

SAS PROGRAM TO EXECUTE A STEPWISE REGRESSION ANALYSIS FOR MODEL 2

```
//WHITMIRE JOB (2440,0171),'WHITMIRE SMC 2309',CLASS=B
//*MAIN ORG=NPGVM1.2440P
//   EXEC SAS
//FILEIN DD DISP=SHR,DSN=MSS.S2440.AMEND
//SYSIN DD *
OPTIONS NOCENTER LS=75 NODATE;
DATA; SET FILEIN.AMEND;
IF HYEC=1 THEN CHYEC=3.5;
IF HYEC=2 THEN CHYEC=8;
IF HYEC=3 THEN CHYEC=9;
IF HYEC=4 THEN CHYEC=10;
IF HYEC=5 THEN CHYEC=11;
IF HYEC=6 THEN CHYEC=12;
IF HYEC=7 THEN CHYEC=13;
IF HYEC=8 THEN CHYEC=14;
IF HYEC=9 THEN CHYEC=15;
IF HYEC=10 THEN CHYEC=16;
IF HYEC=11 THEN CHYEC=18;
IF HYEC=12 THEN CHYEC=20;
IF HYEC=13 THEN CHYEC=11.5;
HYEC=CHYEC;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=1;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=2;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF CATEGORY=1 THEN C1=1;
IF CATEGORY=2 THEN C1=.;
IF CATEGORY=3 THEN C1=2;
PROC FREQ; TABLES C1;
PROC STEPDISC SIMPLE STDMEAN TCORR WCORR; VAR  ASVABAI ASVABSI
     ASVABGI ASVABNO ASVABAD ASVABWK ASVABAR ASVABSP ASVABMK
     ASVABEI ASVABMC ASVABGS ENTRYAGE CHYEC MRTSTAT1 NDPNDNT1
     TERMENLT AFQTPCNT SEX;
CLASS C1;
/*
//
```

APPENDIX G

SAS PROGRAM TO EXECUTE DISCRIMINANT ANALYSIS AND VALIDATION FOR MODEL 2

```
//WHITMIRE JOB (2440,0171),'WHITMIRE SMC 2309',CLASS=C
//*MAIN ORG=NPGVM1.2440P
//   EXEC SAS
//FILEIN DD DISP=SHR,DSN=MSS.S2440.AMEND
//SYSIN DD *
OPTIONS NOCENTER LS=75 NODATE;
DATA; SET FILEIN.AMEND;
IF HYEC=1 THEN CHYEC=3.5;
IF HYEC=2 THEN CHYEC=8;
IF HYEC=3 THEN CHYEC=9;
IF HYEC=4 THEN CHYEC=10;
IF HYEC=5 THEN CHYEC=11;
IF HYEC=6 THEN CHYEC=12;
IF HYEC=7 THEN CHYEC=13;
IF HYEC=8 THEN CHYEC=14;
IF HYEC=9 THEN CHYEC=15;
IF HYEC=10 THEN CHYEC=16;
IF HYEC=11 THEN CHYEC=18;
IF HYEC=12 THEN CHYEC=20;
IF HYEC=13 THEN CHYEC=11.5;
HYEC=CHYEC;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=3;
IF((NOTRCMD=1) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV LT 0309))
THEN CATEGORY=3;
IF((NOTRCMD=0) AND (NUHYPAY GE 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=1;
IF((NOTRCMD=0) AND (NUHYPAY LT 4) AND (LNGTHSRV GE 0309))
THEN CATEGORY=2;
IF CATEGORY=1 THEN C1=1;
IF CATEGORY=2 THEN C1=.;
IF CATEGORY=3 THEN C1=2;
DATA AMEND76; SET DATA1; IF BASD3YR LT 78;
DATA AMEND78; SET DATA1; IF BASD3YR GE 78;
PROC DISCRIM DATA=AMEND76 OUT=B7677 SIMPLE;
   VAR TERMENLT CHYEC NDPNDNT1 AFQTPCNT ASVABMK MRTSTAT1;
CLASS C1;
PROC DISCRIM TESTDATA=AMEND78 DATA=B7677; TESTCLASS C1;
/*
//
```

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